

Fall Ethephon Application For Flower Removal: A New Thinning Approach

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ABSTRACT

Ethephon application at 100 and 200 ppm at early fall (September 19, 2007) significantly reduced (~30-40%) total fruit per tree or per trunk squared area in comparison to 50 ppm or untreated 'Flavorcrest' and 'O'Henry' peaches. Number of fruit was reduced from 33 to 40% per square cm trunk area by the 100 ppm Ethephon application in 'Flavorcrest' and 'O'Henry. However, fall Ethephon applied at this time did not affect 'Mayglo' or 'August Glo' nectarines crop loads. These differences on Ethephon's thinning action may be explained by the differences on flower development physiological stages between cultivars at the time of fall application and/or ethylene susceptibility between freestone and cling cultivar types. Thus, these preliminary results demonstrated that detailed work on the action of Ethephon applied in late summer should be pursued.

INTRODUCTION

Fresh peach production costs have been increasing during the past decade (Day et al., 2004) while grower practices have not changed. Early fruit hand-thinning is a large component of the total production cost. Currently, non reliable technologies are being used to thin the peaches, nectarines, and plums (Byers et al., 1990; Costa and Vizzotto, 2000). Based on earlier studies (Crisosto et al, 1989 and 1990), Ethephon is able to delay bloom and induce bud and stem hardiness on peaches growing in marginal areas. We believe that Ethephon (ethrel) application during last stages of flower differentiation (fall) can reduce the floral pistil viability and crop load for the following season. Therefore, Ethephon fall application during flower differentiation may be a viable approach to reduce flowering and early fruit density. Thus, it may reduce the cost of hand-thinning while leaving fruit production unaffected.

MATERIALS & METHODS

Mature stone fruit trees at a Kearney Agricultural Center (KAC) plot were used in this study. In August 2007, trees were randomly selected and marked. Trees were managed using commercial practices for pest and weed control, fertilization and irrigation. Ethrel containing 21.7% ethephon (Bayer Bioscience) was applied at 0, 50, 100 and 200 ppm to run off on 'O'Henry' and 'Flavorcrest' peaches and to 'August Glo' and 'Mayglo' nectarines when trees were at the 20% stage of leaf drop on September 19, 2007. Six trees were used as replications per each treatment-cultivar, and were sprayed and marked with different colored ribbons. Trees were "harvested" earlier than commercial harvest to measure crop load. 'Mayglo' was harvested on April 23rd while 'O'Henry', 'Flavorcrest', and 'August Glo' were harvested on April 28, 2008. All fruit in each tree were hand-picked and weighed. Then, the total number of fruit per tree was recorded. Because of tree size variability, we measured trunk area and expressed crop load also as fruit per squared trunk (fruit/cm²). The trunk area was expressed as squared centimeters measured at 30 cm above the soil surface.

The study was established in a completely randomized block design. Data was analyzed by ANOVA using SAS (SAS Institute, Cary, NC, 1998). Means were separated by LSD mean separation test at $P \leq 0.05$.

RESULTS

In 'Flavorcrest' and 'O'Henry', Ethephon application at 100 and 200 ppm significantly reduced crop load expressed as total fruit per tree or per squared trunk (fruit/cm²). In both cultivars, there were no significant differences on fruit load between control (untreated) and 50 ppm Ethephon in these two cultivars (Table 1 & 2). Number of fruits per squared trunk area was reduced from six to three by the 100 ppm Ethephon treatment in 'Flavorcrest'. In 'O'Henry', the number of fruits per squared trunk area was reduced from five to three by the 100 ppm Ethephon. This crop load reduction of approximately 30-40% may imply significant commercial savings on thinning costs.

Fall Ethephon application resulted in a trend toward fruit load reduction in 'August Glo', a low chilling requirement mid to late season nectarine cultivar, but no significant difference was observed among Ethephon concentrations. Ethephon application at this time did not affect fruit load in 'Mayglo' nectarine, which is also a low chilling requirement and early season cultivar (Table 1 & 2).

DISCUSSION

These preliminary results indicated that fall (September 19, 2007) applied Ethephon works better as a thinning agent in 'O' Henry' and 'Flavorcrest' peaches than in the low chilling 'August Glo' and 'Mayglo' nectarines. These differences on Ethephon's thinning action may be explained by the differences on flower development physiological stages between cultivars at the time of application, or ethylene susceptibility between freestone and cling cultivar types. In this trial, Ethephon was applied on September 19, 2007

which could have been a good timing for high chilling requirement peaches but not for the low chilling requirement nectarines. In general, Ethephon thinning is not expensive since one gallon of product only costs approximately \$30.00. To make 100 gallons of spraying solution, 350 ml concentrated Ethephon is needed, and costs only \$2.80 in products.

Thus, these preliminary results encourage further detailed work on the action of Ethephon applied during flower development during summer-fall. Future trials need to focus on the Ethephon concentration-timing. This approach will include identifying the sensitive flower development stage for Ethephon in addition to fine-tuning the Ethephon concentrations, and developing an easy technique to determine flower development stage in the orchard.

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Table 1 Influence of fall Ethephon (ethrel) application at 10-20% leaf drop on September 19, 2007 in total fruit number per tree of four cultivars, 2008.

Ethephon (ppm)	Total fruit per tree			
	Flavorcrest	O'Henry	Mayglo	August Glo
0	888	749	853	851
50	843	668	n/a	819
100	820	556	929	788
200	777	657	907	780
LSD (<0.05) ^b	61	181	NS	NS

^a n=6 trees per treatment.

^b Column means were separated according to at $P \leq 0.05$

Table 2. Influence of fall Ethephon (ethrel) application at 10-20% leaf drop on September 19, 2007 in fruit number per squared trunk area of four cultivars, 2008.

Ethephon (ppm)	Fruit per cm ²			
	Flavorcrest	O'Henry	Mayglo	August Glo
0	6	5	5	5
50	6	4	n/a	5
100	5	3	6	4
200	4	3	5	4
LSD (<0.05) ^b	0.4	1.2	NS	NS

^a n = six trees per treatment.

^b Column means were separated according to at $P \leq 0.05$.

Fig. 1: Ethrel (Ethephon) was applied using a sprayer until run-off on September 19, 2007.



Fig. 2. Fruit were “harvested” on 4/28/2008 by hand picking.

